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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

WILSON, SCOTT R

ART UNIT

PAPER NUMBER

2826

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/577,734	Applicant(s) ASHLEY ET AL.	
	Examiner SCOTT R. WILSON	Art Unit 2826	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 28 July 2008.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 51-96 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 51, 52, 54-63, 69-83, 85-88 and 90-96 is/are rejected.
- 7) ☒ Claim(s) 53, 64-68, 84 and 89 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 02 May 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>5/2/2006</u> . | 6) <input type="checkbox"/> Other: _____ |

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DETAILED ACTION

Election/Restrictions

The restriction requirement, as set forth in the Office action mailed on 6/27/2008, has been reconsidered. **The restriction requirement is hereby withdrawn.**

Once a restriction requirement is withdrawn, the provisions of 35 U.S.C. 121 are no longer applicable. See *In re Ziegler*, 443 F.2d 1211, 1215, 170 USPQ 129, 131-32 (CCPA 1971). See also MPEP § 804.01.

Arrangement of the Specification

As provided in 37 CFR 1.77(b), the specification of a utility application should include the following sections in order. **Each of the lettered items should appear in upper case, without underlining or bold type, as a section heading.** If no text follows the section heading, the phrase "Not Applicable" should follow the section heading:

- (a) TITLE OF THE INVENTION.
- (b) CROSS-REFERENCE TO RELATED APPLICATIONS.
- (c) STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT.
- (d) THE NAMES OF THE PARTIES TO A JOINT RESEARCH AGREEMENT.
- (e) INCORPORATION-BY-REFERENCE OF MATERIAL SUBMITTED ON A COMPACT DISC.
- (f) BACKGROUND OF THE INVENTION.
 - (1) Field of the Invention.
 - (2) Description of Related Art including information disclosed under 37 CFR 1.97 and 1.98.
- (g) BRIEF SUMMARY OF THE INVENTION.
- (h) BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING(S).
- (i) DETAILED DESCRIPTION OF THE INVENTION.
- (j) CLAIM OR CLAIMS (commencing on a separate sheet).
- (k) ABSTRACT OF THE DISCLOSURE (commencing on a separate sheet).
- (l) SEQUENCE LISTING (See MPEP § 2424 and 37 CFR 1.821-1.825. A "Sequence Listing" is required on paper if the application discloses a nucleotide or amino acid sequence as defined in 37 CFR 1.821(a) and if the required "Sequence Listing" is not submitted as an electronic document on compact disc).

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

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Claim 70 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 70 depends from itself. For the remainder of this action, claim 70 will be taken to depend from claim 51. Appropriate correction is required.

Claims 80-85 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 80 recites the limitation "the fluid gating structure" in line 1 of the claim. There is insufficient antecedent basis for this limitation in the claim.

Claim 81 recites the limitation "the fluid gating structure" in line 1 of the claim. There is insufficient antecedent basis for this limitation in the claim.

Claim 82 recites the limitation "the fluid gating structure" in lines 1 and 2 of the claim. There is insufficient antecedent basis for this limitation in the claim.

Claim 83 recites the limitation "the fluid gating structure" in line 1 of the claim. There is insufficient antecedent basis for this limitation in the claim.

Claim 84 recites the limitation "the shutter" in line 1 of the claim. There is insufficient antecedent basis for this limitation in the claim.

Claim 85 recites the limitation "the shutter" in line 1 of the claim. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an

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application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 51, 52, 54, 55 and 69-71 are rejected under 35 U.S.C. 102(e) as being anticipated by Tornow et al. (US 2006/0154489 A1). As to claim 51, Tornow et al. discloses (paragraph [0009]), and Figure 2B, a molecular single electron transistor (MSET) detector device comprising at least one organic molecule attached to a drain electrode and a source electrode wherein, in use, said at least one organic molecule provides a quantum confinement region characterized in that at least one analyte receptor site is provided in the vicinity of said at least one organic molecule.

As to claim 52, Tornow et al. discloses (paragraph [0009]), and Figure 2B, that at least one organic molecule provides at least one analyte receptor site.

As to claim 54, Tornow et al. discloses (paragraph [0009]), and Figure 2A, that at least one organic molecule is an elongated conjugated ("conjugated π -electron system") organic molecule having first and second ends, the first end being attached to the source electrode and the second end being attached to the drain electrode.

As to claim 55, Tornow et al. discloses (paragraph [0022]) that a single organic molecule may be attached to the source electrode and the drain electrode.

As to claim 69, Tornow et al. discloses (end of paragraph [0011]), means for measuring the conductivity of the at least one organic molecule as a function of applied source-drain voltage.

As to claim 70, Tornow et al. discloses (paragraph [0024]) means for measuring the conductivity of the at least one organic molecule as a function of applied gate voltage.

As to claim 71, Tornow et al. discloses (paragraph [0011], last sentence) discloses integral electronic circuitry for measuring the conductivity of the at least one organic molecule.

Claims 92-94 are rejected under 35 U.S.C. 102(e) as being anticipated by Tornow et al.. As to claim 92, Tornow et al. discloses (paragraph [0009]), and Figure 2B, a method of chemical detection comprising the steps of; (a) taking a molecular single electron transistor comprising at least one organic molecule attached to a drain electrode and a source electrode wherein, in use, said at least one organic

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molecule provides a quantum confinement region and (b) providing at least one analyte receptor site in the vicinity of said at least one organic molecule for receiving analytes.

As to claim 93, Tornow et al. discloses (paragraph [0006] and [0012]) the step of (c) measuring the electrical characteristics of said molecular single electron transistor to determine the presence or otherwise of an analyte.

As to claim 94, Tornow et al. discloses (paragraph [0024]) the step of passing a fluid over the at least one analyte receptor site.

Claim 95 is rejected under 35 U.S.C. 102(e) as being anticipated by Tornow et al.. Tornow et al. discloses (paragraph [0009]), and Figure 2B, a molecular single electron transistor (MSET) detector device comprising at least one organic molecule attached to a drain electrode and a source electrode wherein, in use, said at least one organic molecule provides a quantum confinement region characterized in that at least one of said source electrode and said drain electrode are formed from semiconductor material.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 56-58 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tornow et al. in view of Shih et al. (US 6,586,787). As to claim 56, Tornow et al. discloses an MSET device according to claim 51, as described above. Tornow et al. does not disclose expressly that at least one organic molecule is attached to the source and drain electrodes via tunnel barriers. Shih et al., Figure 1b, discloses a single-electron device in which the quantum confinement region is attached to the source and drain via tunnel barriers (OX)(col. 1, lines 17-18). At the time of invention, it would have been obvious to a person of ordinary skill in the art to form the MSET of Tornow et al. with the tunnel barriers of Shih et al..

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The motivation for doing so would have been to realize the necessary confining tunnel barriers in the MSET of Tornow et al., which comprises at least one organic molecule. Therefore, it would have been obvious to combine Shih et al. with Tornow et al. to obtain the invention as specified in claim 56.

As to claim 57, Shih et al., Figure 1b, discloses that the tunnel barriers are provided by electrically insulating regions (OX) of what would be the organic molecule, when combined with Tornow et al..

As to claim 58, Shih et al., Figure 1b, discloses that the source and drain electrodes each comprise an insulating material that forms said tunnel barriers, in the same sense as applicants Figure 8..

Claims 59-63 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tornow et al. in view of Shih et al.. As to claim 59, Tornow et al. discloses an MSET device according to claim 51, as described above. Tornow et al. does not disclose expressly that a first layer of material provides the source electrode and a second layer of material provides the drain electrode wherein said first and second layers sandwich, and are spaced apart by, a third layer of substantially insulating material. Shih et al., Figure 1b, discloses a first layer of material that provides the source electrode (S) and a second layer of material that provides the drain electrode (D) wherein said first and second layers sandwich, and are spaced apart by, a third layer of substantially insulating material (OX). At the time of invention, it would have been obvious to a person of ordinary skill in the art to form the MSET of Tornow et al. with the source, drain and insulating layers of Shih et al.. The motivation for doing so would have been to realize the necessary confining tunnel barriers in the MSET of Tornow et al., which comprises at least one organic molecule. Therefore, it would have been obvious to combine Shih et al. with Tornow et al. to obtain the invention as specified in claim 59.

As to claim 60, Shih et al., Figure 1b, discloses a gate electrode (G).

As to claim 61, Tornow et al., Figure 3, discloses that a recess is provided in the third layer of what would be the substantially insulating material, when combined with Shih et al., to provide a region between the source and drain electrodes in which the at least one organic molecule is located. The recess is located at the top surface of the n-GaAs layer.

As to claim 62, Tornow et al., Figure 3, discloses that the thickness of the third layer of what would be the substantially insulating material, when combined with Shih et al., is substantially equal to the

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length of the at least one organic molecule. Paragraph [0020] teaches that the thickness is of order 5 nm, which is of molecular scale.

As to claim 63, Tornow et al., Figure 3, discloses that at least one of the first and second layers of material comprise semiconductor material, embodied as AlGaAs.

Claims 72-78 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tornow et al. in view of Northrup et al. (US 5,882,496). As to claim 72, Tornow et al. discloses an MSET device according to claim 51, as described above. Tornow et al. does not disclose a fluid analyzer comprising the MSET device of Tornow et al.. Northrup et al. discloses (col. 7, lines 58-66) a fluid analyzer, more fully described below. At the time of invention, it would have been obvious to a person of ordinary skill in the art to form the MSET of Tornow et al. with the fluid analyzer of Northrup et al.. The motivation for doing so would have been to realize the desirable analytical instrument (col. 7, lines 65-66) of Northrup et al. by using the MSET of Tornow et al.. Therefore, it would have been obvious to combine Northrup et al. with Tornow et al. to obtain the invention as specified in claim 72.

As to claim 73, Northrup et al. discloses that the fluid analyzer comprises a pre-concentrator for release ably retaining analytes from a fluid (Abstract).

As to claim 74, Northrup et al. discloses that the pre-concentrator comprises a layer of material having a plurality of apertures ("porous") through which a fluid can be passed, the internal surfaces of said apertures being adapted to releaseably retain analytes from the fluid (Abstract).

As to claim 75, Northrup et al. discloses (col. 2, lines 9-12) that the internal surfaces defining said plurality of apertures of the pre-concentrator are porosified.

As to claim 76, Northrup et al. discloses (Abstract) that the layer of material from which the pre-concentrator is formed comprises a layer of silicon, said apertures being formed through said layer of silicon and arranged to form a honeycomb structure.

As to claim 77, Northrup et al. discloses (col. 2, lines 14-16) that the internal surfaces of the apertures of the pre-concentrator are reversibly adsorptive.

As to claim 78, Northrup et al. discloses (col. 7, line 23) that the pre-concentrator comprises a heater (65).

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Claims 79-88, 90 and 91 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tornow et al. in view of Northrup et al., and further in view of applicants prior art. As to claim 79, Tornow et al. in view of Northrup et al. discloses an analyzer according to claim 73, as described above. Tornow et al. in view of Northrup et al. does not disclose a fluid gating structure for controlling the flow of fluid from the pre-concentrator to the MSET device. Applicant discloses (Specification, page 2, lines 14-19) fluid gating structures formed to control the fluid flow through the pre-concentrator. At the time of invention, it would have been obvious to a person of ordinary skill in the art to form the analyzer of Tornow et al. in view of Northrup et al. with the fluid gating structure of applicants prior art. The motivation for doing so would have been to provide the required gas flow control function (Specification, page 2, line 19). Therefore, it would have been obvious to combine applicants prior art with Tornow et al. in view of Northrup et al. to obtain the invention as specified in claim 79.

As to claim 80, applicants prior art discloses (Specification, page 2, lines 15-18) that the fluid gating structure is arranged to selectively route fluid from the pre-concentrator to either one of the MSET device and an exhaust port.

As to claim 81, applicants prior art discloses that thermopneumatic valves based on diaphragm architectures are used to control gas flow. An example of a thermopneumatic valve is shown in Cui (http://www.ccmicro.rl.ac.uk/info_microfluidics.html#2.2.3), Figure 8, which teaches that the fluid gating structure comprises a substantially planar substrate and a shutter that is moveable in the plane of said substrate. Motion into and out of the plane of the substrate is within the scope of motion in the plane of the substrate.

As to claim 82, the example thermopneumatic valve of Cui, Figure 8, teaches that fluid is routed from the fluid gating structure along a channel ("Flow") having a long axis that is substantially perpendicular to the plane of the substantially planar substrate of the fluid gating structure.

As to claim 83, the example thermopneumatic valve of Cui, Figure 8, teaches that the fluid gating structure comprises a shutter that is shaped such that it can engage and seal the entrance ("Flow") to said channel.

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As to claim 85, the example thermopneumatic valve of Cui, Figure 8, teaches that the shutter is a micro-electromechanical (MEMS) shutter (caption, "microvalve").

As to claim 86, the example thermopneumatic valve of Cui, Figure 8, teaches that the fluid gating structure comprises a MEMS electro-thermal actuation mechanism, embodied as the heating of trapped fluid in the valve, to impart movement to the MEMS shutter.

As to claim 87, the example thermopneumatic valve of Cui, Figure 8, teaches that the fluid gating structure further comprises a MEMS compliant displacement mechanism.

As to claim 88, the example thermopneumatic valve of Cui, Figure 8, teaches that the pre-concentrator, fluid gating device and MSET device are formed as substantially planar layers and are arranged in a stack.

As to claim 90, the example thermopneumatic valve of Cui, Figure 8, is within the scope of being a fluid pump.

As to claim 91, Northrup et al. discloses (col. 5, lines 45-47) an integral power source.

Claims 96 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tornow et al. in view of Shih et al.. Tornow et al. discloses a method of forming a molecular single electron transistor comprising the steps of (i) forming source and drain electrodes and (ii) locating an organic molecule between said source and drain electrodes. Tornow et al. does not disclose expressly that the source and drain electrodes are formed using a complementary metal oxide (CMOS) process. Shih et al., Figure 1a, discloses a first layer of material that provides the source electrode (S) and a second layer of material that provides the drain electrode (D) wherein said first and second layers sandwich, and are spaced apart by, a third layer of substantially insulating material (OX). Such a structure, formed on a silicon wafer (col. 5, lines 19-26), may be formed by a CMOS process. At the time of invention, it would have been obvious to a person of ordinary skill in the art to form the MSET of Tornow et al. with CMOS process of Shih et al.. The motivation for doing so would have been to form the device using economical silicon processing. Therefore, it would have been obvious to combine Shih et al. with Tornow et al. to obtain the invention as specified in claim 96.

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Allowable Subject Matter

Claim 53 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. No prior art discloses the claimed device with an adjacent analyte receptor, not attached to the organic molecule.

Claims 64 and 65 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. No prior art discloses the claimed device where the source or drain electrodes comprise silicon or where the end chains of the organic molecule expressly bind to silicon

Claims 66-68 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. No prior art discloses the claimed device where the first layer of material comprises a silicon wafer, the second layer of material expressly comprises polysilicon and the third layer of substantially insulating material comprises a silicon oxide.

Claim 84 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. No prior art discloses the claimed device wherein the shutter may be retained, without the application of power, in an open position in which fluid is routed from the pre-concentrator to the MSET device or in a closed position in which fluid is routed from the pre-concentrator to an exhaust port.

Claim 89 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. No prior art discloses the claimed device wherein each substantially planar layer expressly comprises silicon.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Scott R. Wilson whose telephone number is 571-272-1925. The examiner can normally be reached on M-F 8:30 - 4:30 Eastern.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan Flynn can be reached on 571-272-1915. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

srw
November 22, 2008

/Evan Pert/

Primary Examiner, Art Unit 2826